



Bellcomm

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date: March 7, 1972

to: Distribution

from: K. P. Klaasen

subject: Maximum Allowable Emergency Return
Distance for Lunar Geology Traverses
Using the LRV Without the BSLSS --
Case 310

MEMORANDUM FOR FILE

Lunar geology traverses must always remain close enough to the LM so that an emergency return and ingress may be accomplished within the capability of the available back-up life support system. Some confusion has arisen over the maximum allowable return distance for traverses using the LRV and having only the Oxygen Purge System (OPS) available to supply oxygen and cooling should the Portable Life Support System (PLSS) fail. Such a situation exists on one-man EVA's and on two-man EVA's without a Buddy Secondary Life Support System (BSLSS).

Upon failure of a PLSS, the crewman must activate his OPS and drive back to the LM. The OPS can be operated at either of two oxygen flow rates during the return; a 4.0-lb/hr low purge or a 7.8-lb/hr high purge rate. Both modes provide sufficient oxygen for breathing and maintaining suit pressure. The high purge mode provides twice as much cooling as the low purge mode but has only half the lifetime. Using the OPS in the high purge mode during the emergency return and ingress allows the driveback distance to be up to 3.2 km. This distance is constrained by the OPS lifetime. Using the OPS in the low purge mode allows for emergency rideback distances up to 3.9 km. Distance using the low purge mode is limited by a 300-BTU heat storage limit for the crewman.

The emergency rideback distance is actually maximized by using the OPS partly in the low purge and partly in the high purge mode. For the optimum ratio of time in the high and low purge modes, the allowable emergency rideback distance is 7.0 km. Figure 1 plots return distance allowed against the integrated average OPS flowrate used during the return and ingress. The OPS should be cycled to the high purge mode whenever necessary to keep heat storage below 300 BTU. Figure 2 shows one possible plan for using the OPS to achieve a 7.0 km rideback. Figure 3 lists the assumptions used in determining the allowable emergency rideback distances.



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(NASA-CR-126119) MAXIMUM ALLOWABLE
EMERGENCY RETURN DISTANCE FOR LUNAR GEOLOGY
TRAVERSES USING THE LRV WITHOUT THE BSLSS
(Bellcomm, Inc.) 6 p



Current Mission Rules (Revision A) require rideback using high purge and, therefore, limit distance from the LM to 3.2 km for an LRV traverse without the BSLSS. The OPS can be used more efficiently by allowing use of the low purge mode, thereby increasing the allowable traverse distance and possibly bringing some desirable geology objectives within range that would currently be inaccessible.

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Attachments
Figures 1 - 3

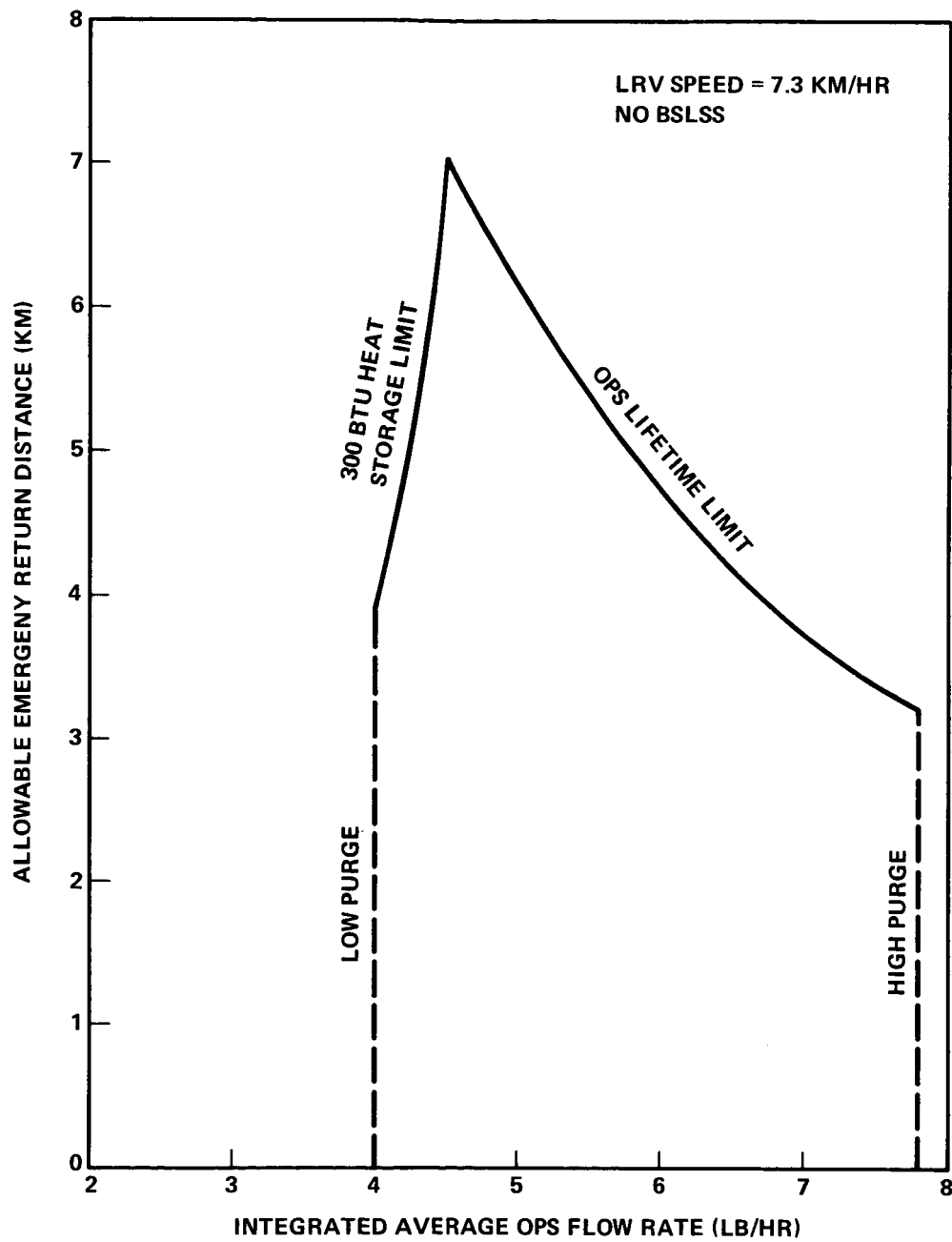


FIGURE 1 - MAXIMUM ALLOWABLE EMERGENCY RETURN DISTANCE AS FUNCTION OF AVERAGE OPS FLOWRATE

OPS FLOW RATE	ACTIVITY	TIME DURATION (MIN)	DISTANCE TRAVELED (KM)	INITIAL HEAT STORAGE (BTU)	FINAL HEAT STORAGE (BTU)	OXYGEN USED (LB)
LOW	RIDING	58	7.0	100	246	3.85
LOW	INGRESS	3	---	246	277	.23
HIGH	INGRESS	10	---	277	300	1.25
T O T A L						5.33

FIGURE 2 - PLAN FOR USING OPS TO ACHIEVE 7.0 KM RIDEBACK

ASSUMPTIONS

LRV MOBILITY RATE = 7.3 KM/HR

	LOW PURGE	HIGH PURGE
	<u>4.0 LB/HR</u>	<u>7.8 LB/HR</u>
OPS USABLE O ₂	5.37 LB	5.07 LB
OPS COOLING RATE	400 BTU/HR	800 BTU/HR

MAXIMUM HEAT STORAGE ALLOWED = 300 BTU

INITIAL HEAT STORAGE = 100 BTU

INGRESS REQUIRES 13 MIN AT 950 BTU/HR

RIDING INVOLVES 550 BTU/HR

CREW IS AT THE LRV AND DEPARTS FOR THE LM IMMEDIATELY UPON OPS ACTIVATION.

FIGURE 3



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